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CASE REPORT

Heat-cured soft acrylic resin obturator for maxillary osteomyelitis rehabilitation: A patient-centered approach

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ABSTRACT

This patient-centered approach describes the prosthetic rehabilitation of a 66-year-old male diagnosed with maxillary osteomyelitis, treated using a heat-cured soft acrylic resin obturator. Following bilateral sequestrectomy of the maxillary molar region, a perforation to the left maxillary sinus was identified. The patient was referred to the maxillofacial prosthetics clinic at Institute of Science Tokyo for rehabilitation. Treatment commenced with the placement of an immediate surgical obturator, followed by a definitive obturator fabricated conventionally with heat-cured soft acrylic resin to minimize tissue irritation. Speech performance was assessed using digital acoustic analysis, and patient satisfaction was evaluated through a structured questionnaire. While the definitive obturator fit well and reduced nasality in speech, the patient initially reported difficulties with consonant production. Subsequent adjustments to the obturator's polished surface improved speech articulation, leading to patient satisfaction with the obturator. This case highlights the effectiveness of a rehabilitation using heat-cured soft acrylic resin obturator and the detailed adjustment of it referring to the result of acoustic analysis in restoring function and achieving high satisfaction levels in patients with maxillary osteomyelitis. (*Int J Maxillofac Prosthetics 2025;8:17-22*)

Keywords

Osteomyelitis, maxilla, prosthodontics, obturators, speech disorders.

AUDIOABSTRACTACT

INTRODUCTION

Osteomyelitis is a bone infection that leads to necrosis and sequestration, typically caused by microorganisms such as Staphylococcus aureus and, less commonly, Streptococcus, Pneumococcus, or Enterobacteriaceae.[1] Although osteomyelitis can affect the maxillofacial region, maxillary involvement is relatively rare compared to mandibular osteomyelitis due to the maxilla's cancellous bone structure and extensive blood supply.[2] Osteomyelitis primarily occurs in the fifth and sixth decades of life and is frequently associated with systemic conditions such as diabetes mellitus, autoimmune diseases, agranulocytosis, leukemia, anemia, nutritional deficiencies, syphilis, malignancies, and the effects of chemotherapy, radiotherapy, or substance abuse, including alcohol and tobacco.[3-5] Treatment often necessitates a combination of antibiotics, surgical debridement, and prosthetic rehabilitation to restore function and aesthetics.[6]

Patients with maxillary osteomyelitis often experience significant functional impairments, such as difficulty with speech and mastication, as well as aesthetic deformities.[7] Prosthetic rehabilitation with obturators is a widely used treatment modality to address these challenges. Conventional obturators are typically fabricated with hard acrylic resin, but their rigidity and incompatibility with inflamed or necrotic tissues may exacerbate patient discomfort and impair healing. Soft

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relining materials have been used to mitigate these issues, but they are prone to dimensional changes and hygiene-related complications.[8] On the other hand, obturators made from heat-cured soft acrylic resin offer improved biocompatibility, reduced irritation, and greater adaptability to the unique anatomical and pathological conditions of osteomyelitis patients.[8] Additionally, careful obturator design can reduce stress on the necrotic bone and enhance functional outcomes.

This case report aims to present the prosthetic rehabilitation of a patient with chronic maxillary osteomyelitis using a heat-cured soft acrylic resin obturator. The approach also evaluates the patient's speech performance through digital acoustic analysis and assesses satisfaction levels following the fabrication and adjustment of the obturator. The findings highlight the importance of material selection and design optimization in achieving functional and aesthetic restoration, as well as patient satisfaction, in cases of maxillary osteomyelitis.

CASE REREPORT

A 66-year-old male patient was diagnosed with familial chronic maxillary osteomyelitis. Bilateral sequestrectomy of the maxillary molar region resulted in a perforation extending from the left maxilla into the sinus cavity (Fig 1). The patient was referred to the Clinics for Maxillofacial Prosthetics at the Institute of Science Tokyo for prosthetic rehabilitation. Comprehensive diagnostic records, including photographs, casts, and radiographs, were obtained. The proposed treatment plan was thoroughly discussed with the patient, outlining the procedures for rehabilitation.

The treatment began with the fabrication of an immediate surgical obturator, followed by a definitive obturator. The initial definitive obturator was fabricated conventionally with a hard acrylic resin base and a metal framework. However, this material caused irritation in the osteomyelitic region, necessitating modifications. A soft lining material was added to the fitting surface of the obturator to reduce irritation (Fig 2). Despite these adjustments, the patient experienced difficulty cleaning the soft lining surface,

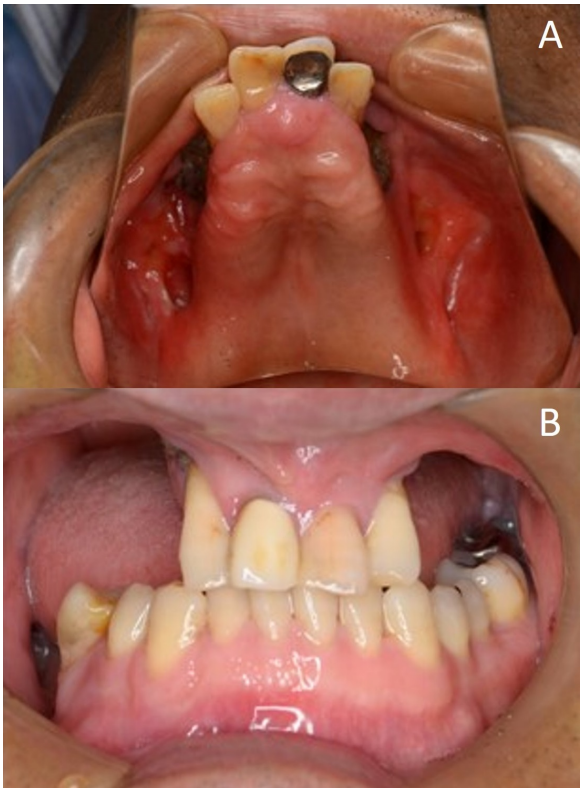

Fig 1. Bilateral sequestrectomy of the maxillary molar region. (A) Intraoral view. (B) Anterior view.

anatomical alterations caused by osteomyelitis, and speech-related issues, prompting the need for a new obturator.

The process for the new definitive obturator began with preliminary impressions of the maxillary and mandibular jaws using irreversible hydrocolloid material (Algiace Z, Dentsply-Sankin), which were poured in stone to produce diagnostic casts. Custom trays were fabricated for both jaws, and definitive impressions were taken with hydrophilic vinyl polysiloxane material (Examix Fine Regular, GC Corporation). The impressions were poured in dental stone to create definitive casts. Interocclusal recordswere obtained, and the casts were mounted on an articulator. The prosthesis incorporated casted rests and wire retainers on the remaining natural teeth and a palatal fenestration to provide undercut engagement for enhanced retention.

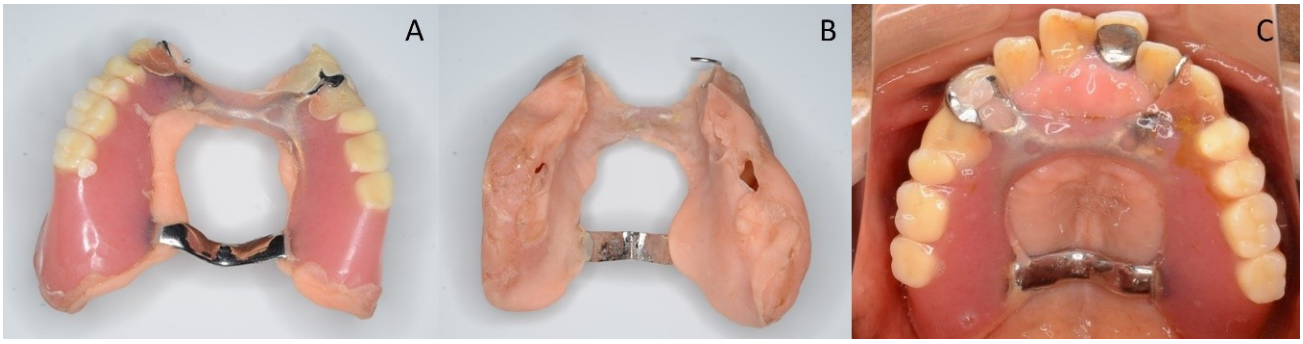

Fig 2. The initial definitive obturator fabricated with hard acrylic resin and metal framework. (A) Polished surfaces (B) Fitting modified surfaces with a soft lining material. (C) Obturator fitted in the defect.

Fig 3. Completed definitive obturator fabricated with heat-cured soft acrylic resin. (A) Polished surfaces. (B) Fitting surfaces. (C) Anterior view.

Artificial teeth were arranged on the base and the fit was verified intraorally. The definitive obturator was processed using heat-cured soft acrylic resin (Vertex soft, Vertex-Dental B.V.) to minimize tissue irritation and was finished and polished using conventional techniques (Fig 3). The obturator was fitted in the patient's mouth (Fig 4), instructions on the use and care of the obturator were given to the patient, and attended three months to monitor progress and address any concerns.

Speech performance was evaluated using digital acoustic analysis.[9] Nasality was measured with a nasalance measurement device (Nasometer II Model 6450, Pentax). With wearing the headset with the metal separation adjusted under the nose, the patient was asked to utter a sentence which include no nasal sound for three times for each condition; without using obturator, with using old obturator and new obturator. The average of the mean nasalance score was recorded. Syllable utterances of /ari/ were recorded and analyzed with a speech analysis system (Computerized Speech Lab Model 4500, Pentax) (Figs 5, 6) using Fast Fourier Transform (512 points, 16 bits) with a 16,000 Hz sample rate to generate broadband spectrograms. The spectrograms were compared before and after adjustments to the polished surface of

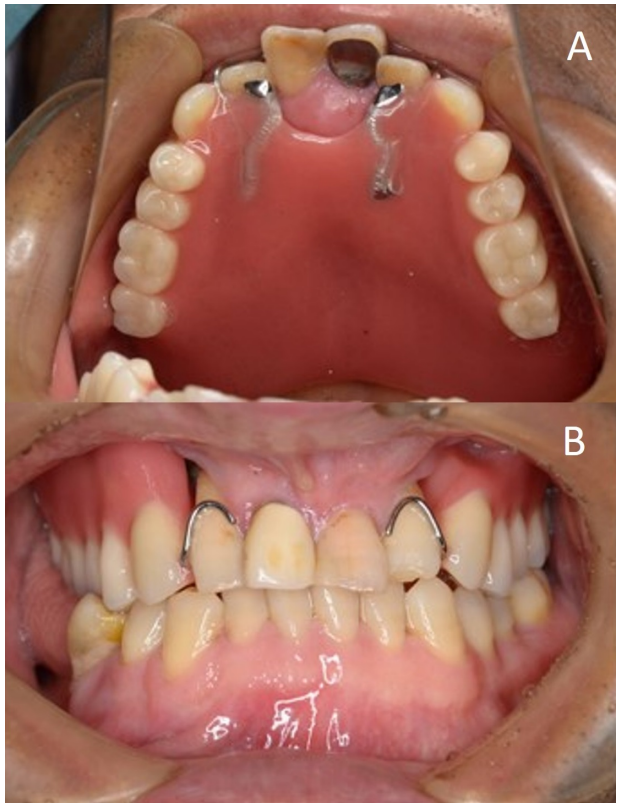

Fig 4. Definitive obturator in situ, demonstrating proper adaptation to the defect area. (A) Palatal view. (B) Anterior view.

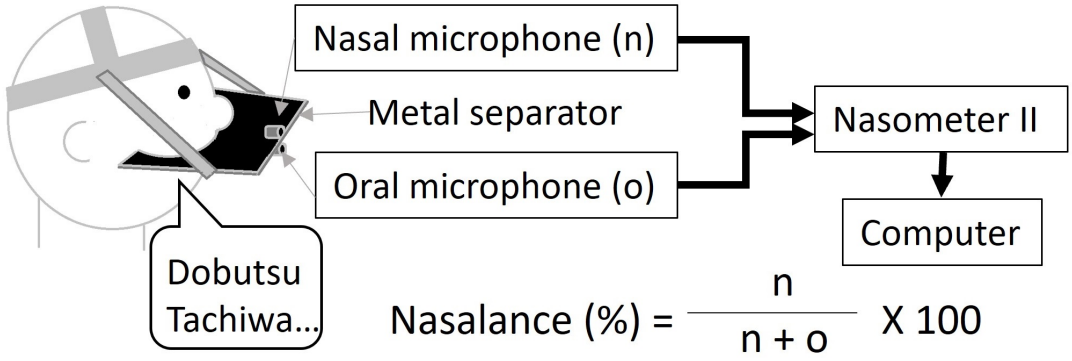

Fig 5. Digital acoustic analysis using the nasalance measurement device to evaluate nasality levels before and after obturator adjustment.

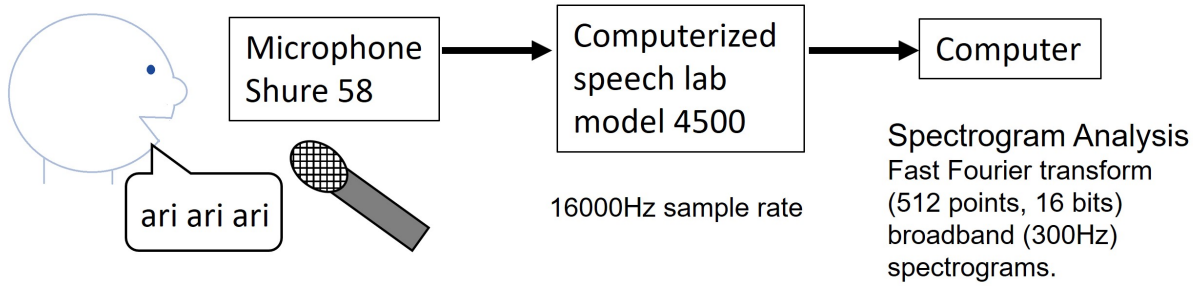

Fig 6. Speech analysis of the syllable utterance /ari/ using the speech analysis system.

the new obturator. A patient satisfaction questionnaire assessed eating, chewing, appearance, speech, and overall prosthesis satisfaction. While the new obturator improved nasality (Fig 7) and fit, the patient initially reported challenges with consonant production especially when producing the syllable /ri/. Adjustments to the polished surface further enhanced speech clarity, as confirmed by spectrogram analysis showing the clearer distinct transition from the vowel to the consonant after the adjustment compared to before adjustment (Fig 8). Ultimately, the patient expressed satisfaction with the restored oral function and aesthetics provided by the adjusted obturator (Fig 9).

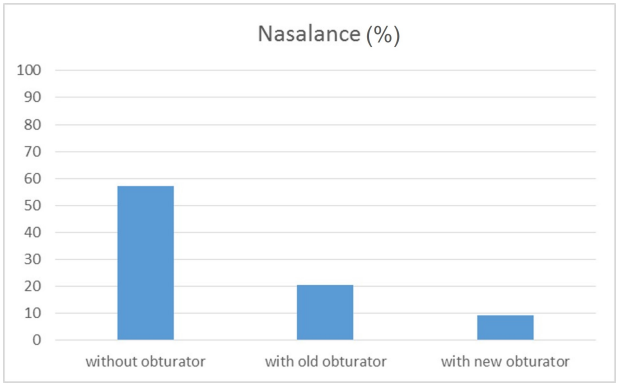

Fig 7. Reduction in nasality levels following the adjustment of the obturator as confirmed by acoustic analysis.

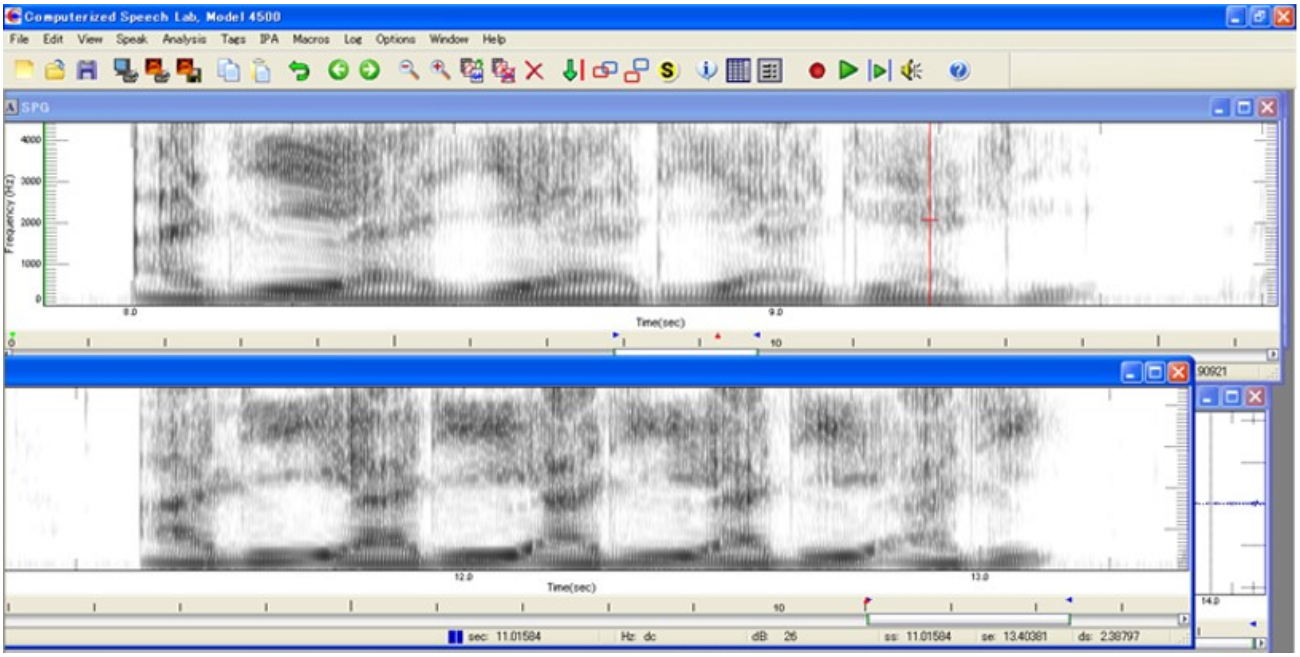
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Fig 8. The result of spectrogram analysis before (upper) and after (lower) adjustment.

DISCUSSION

The rehabilitation of patients with chronic maxillary osteomyelitis presents unique challenges, particularly in restoring oral function, speech, and aesthetics while minimizing irritation to necrotic or inflamed tissues. This case demonstrates the clinical value of using a heat-cured soft acrylic resin obturator to address these challenges effectively.

Maxillary osteomyelitis is a relatively rare condition due to the extensive blood supply of the maxilla's cancellous bone, and its management often involves a combination of surgical and prosthetic interventions.[10] In this case, bilateral sequestrectomy resulted in a significant defect, necessitating immediate and long-term prosthetic rehabilitations. Initial treatment with a conventional obturator made from hard acrylic resin and a metal framework was unsuitable for the patient's osteomyelitic condition, as these materials caused irritation and were challenging to maintain hygienically. While the addition of a soft lining material temporarily alleviated irritation, it introduced new complications, including maintenance difficulties and dimensional instability.

The use of a heat-cured soft acrylic resin in the fabrication of the definitive obturator proved to be a critical factor in achieving functional and aesthetic success. Unlike traditional materials, the soft acrylic resin provided biocompatibility and flexibility, reducing tissue irritation and adapting to the dynamic changes in the defect area caused by osteomyelitis.[8] Additionally, the incorporation of design elements such as cast clasp retainers and palatal fenestration enhanced prosthesis retention and stability, addressing the patient's specific anatomical and functional needs.

In this case, the Japanese syllable /ari/ was selected as a sample utterance for the spectrum analysis because the patient complained that he had difficulty to pronounce /ri/. Besides the test syllables commonly used in speech analysis, it is also effective to select the test syllable according to patients needs. Since consonant production is influenced by the preceding vowel, the most basic vowel /a/ was added at the beginning of the syllable /ri/ to standardize the conditions for consonant production. Speech evaluation through digital acoustic analysis highlighted the effectiveness of the new obturator in improving nasality, a critical component of speech clarity. However, the patient's initial difficulty with consonant production highlighted the importance of precise adjustments to the obturator's polished surface. The subsequent improvements observed in the spectrogram analysis demonstrate that tailored modifications can significantly enhance speech outcomes. In addition, patient satisfaction is a key indicator of the success of prosthetic rehabilitation.[11] In this case, satisfaction was assessed through a structured questionnaire evaluating aspects such as appearance, speech, and mastication. Despite initial challenges, the patient reported high levels of satisfaction

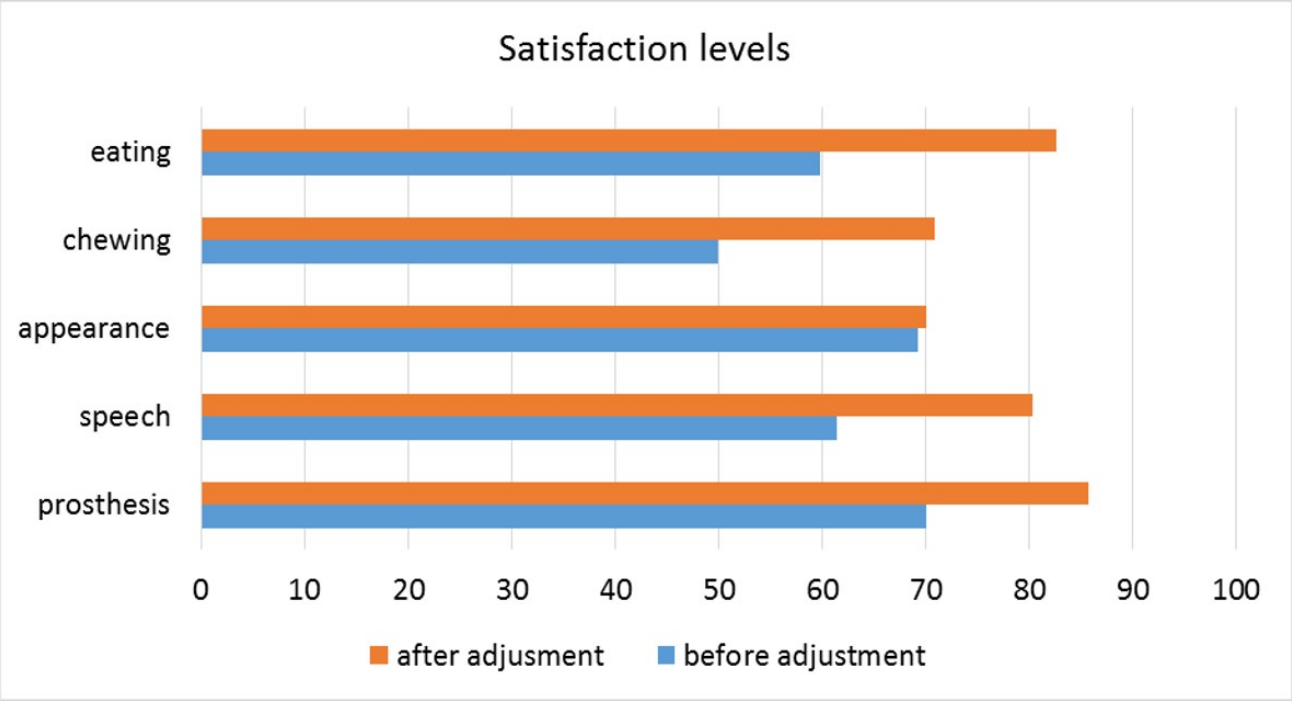

Fig 9. The result of spectrogram analysis before (upper) and after (lower) adjustment.

following the adjustments to the obturator, confirming the importance of iterative refinements in meeting patient expectations and improving quality of life.

CONCLUSION

This case demonstrates the importance of material selection and prosthesis design in the management of complex maxillary defects associated with osteomyelitis. The findings suggest that heat-cured soft acrylic resin obturators are a viable option for minimizing tissue irritation and accommodating the functional demands of such patients.

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